

## **ABSTRACT**

The present invention relates to compositions and methods for the production of Betaine lipids. The methods of the present invention comprise the expression of recombinant enzymes (e.g. from *Rhodobacter sphaeroides*) in host cells (e.g. bacteria, yeast, and plants) to produce  
5 Betaine lipid compounds including, but not limited to, Diacylglycerol-*O*-4'-(*N,N,N*-trimethyl) homoserine (DGTS). The methods and compositions of the present invention may be utilized such that the amount of phosphate containing fertilizer required for the growth of a particular plant is decreased.